

### Abstract

*Motivation*: Thermal comfort drives ~40% of residential use, with the smart thermostat promising to improve comfort, sustainability, and economics.

**Challenge:** Current dataset are insufficient for studying the internal workings of the building physics.

Vision: Automate current control systems that interact with building physics. Built upon user behavior models in order to keep occupants comfortable and away from intervention.

**Goal:** Create a smart home emulator that mimics building physics by bridging information from devices like Ecobee, Raspberry Pi, Home Assistant and Smart plugs.

#### **Conclusion**

Building energy simulations poorly capture impact of thermostats and occupant behavior. This prototype enables physically testing these variables without costly field tests.

#### Human-in-the-Loop Smart Home Prototype

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# Future Research

- Edit, share, and implement advanced control algorithms.
- Integrate emulator into whole building simulation.
- Develop models that interact with building physics, social cognition and human psychology to create robust human in the loop infrastructures







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